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ABSTRACT

The development of a self-instruction package on making notes from reading which was designed for new students at Newcastle Polytechnic in the United Kingdom is described. Notemaking skills involve recognition of topics and topic sentences in a written text, picking out key content words in the text, recognition of key relationships and development of a set of concise nonverbal symbols for representing these relationships, development of a system of notemking (headings, subheadings, numbered or lettered points) and selection among key content and relationship data according to some given criteria. A program for training students in these skills was developed using a tape-slide presentation plus practice material. Tests of the effectiveness of the package involved three student groups: one instructed by machine only with no classes, one taught the same material in a weekly class, and a control group. Results indicate that notemaking is a teachable and testable skill, but the overall results of machine teaching and class teaching are not substantially different. (SW)

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TEACHING STUDENTS TO MAKE NOTES BY MACHINE

C.C. deWinter Hebron

The diversification of courses and increases in number and range of students, which characterised U.K. Higher Education in the late 1960s and early 1970s, inevitably brought with it an increasing concern with teaching and with student study problems. Two main areas of concern emerged during this period - how to cater for a new kind of student, for whom the myth of higher education as an apprenticeship for a scholarly career was no longer even remotely venable, and how to overcome the problem of students formally qualified for higher education but not prepared by their school experience for the independent study that it had traditionally entailed.

This latter area was of particular interest, during 1973, to a group of staff in Newcastle Polytechnic (of whom I was one) that formed the institution's "How to Study" working party. We were concerned to discover, if possible, what students needed to know without study methods on first arrival, what techniques they needed to acquire and how these could be acquired, and what problems they had and how these could be overcome. One basic problem soon emerged; namely, the difficulty encountered by many first year students, especially in science and technology, of making adequate and coherent notes from their reading. One answer, clearly, was to lay on courses or workshops in notemaking for all new students; but the problem then arose of how one could possibly find enough staff to teach all the relevant students at roughly the same time - in the first week or so of their courses.

A self-instruction package seemed the logical answer, and I was commissioned to produce and test one. This paper describes the nature of that package, its initial tests, the hypotheses derived from them, and the results of further tests on these hypotheses. Some of the earlier material in it has also been reported in the Proceedings of the Heidelberg Conference on Improving University Teaching (May 1975), and in Issue 9 of the Bulletin of Educational Research.

The self instruction package concerned was developed from a series of existing classes in notemaking. It was based on the assumption that making effective notes from a text could be broken down into a series of relatively simple general behavioural skills, viz:

1. recognition of topics and topic sentences in a written text, and response to them by writing a heading, .

2. recognition and response by transcription of key content words in the text,

3. recognition of key relationships (A+B, A ∴ B, of A then B, etc) and development of a set concise non-verbal symbols (+, ∴, →, etc) for representing these relationships (these need not be standard but must be consistent and meaningful to the note maker),

4. development of a general systematic, ordered notemaking response-pattern (headings, subheadings, numbered or lettered points) simple enough for most material to fit into it, and thus capable of repeated application as a response to develop different texts,

5. Selection among key content and relationship data according to some given or self-generated criteria, the notemaker then responding only to those items selected.

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A programme for training the student in these five skills was then developed using a tape-slide presentation plus practice material of steadily increasing complexity drawn from areas generally understandable by students of science and technology, culiminating in practice work on a 1300 words journal article introduction. If there was no need for the student to repeat after any of the practice pauses, the whole programme would take about 3 to 4 hours to work through, and breaks were therefore introduced at convenient points (after the initial practice and presentation of a given skill, say, or immediately before a jump to a higher cognitive level). After some initial engineering difficulties, the total package was installed in the Main Library A - V room in November 1974, in a form available for use either by individuals or by groups of up to six students.

Initial tests on the effectiveness of the package were carried out in January and February 1975, with two full-time classes, one of electrical engineers and one of chemists. These classes were divided randomly into three groups, and over the three following weeks were taught as follows:

Group One - used the machine only, in their own time. Did not come to 'Communication' classes

Group Two - were taught exactly the same material, by me, in the weekly 'Communication' classes (it was, incidentially, my voice on the Group 1 tape),

Group Three (Control) - received no instruction in this area at all.
All three groups undertook not to discuss the teaching or the material with each other.

In the fourth week, the classes reassembled and all members made a practice note (on a neutral subject - the history of plastics) from a test article slightly shorter and less difficult linguistically than the final practice piece. Students had been told clearly at the outset that results in this test would not be counted for assessment, and all papers were anonymous. These tests were then marked twice - once for cognitive grasp of the material (key information included) and once for similarity of the made note to the general pattern and techniques taught. The results were:-

Cognitive Grasp

Group / Score	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 30
1	-	-	3	4	3	-
2	-	-	2	3	2	1
3	-	-	1	2	3	-

Patterning Behaviour

Group / Score	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 30
1	-	3	1	3	2	1
2	-	-	3	3	2	-
3	2	3	1	-	-	-

Table 1 : Test Results (Initial Groups)

Because only two groups were involved, and in a three-way split - and because a substantial number of overseas students had to be excluded - these results were too limited to be amenable to statistical treatment. However, they did serve to enable a set of hypothese to be generated, particularly when individual results on both scorings were cross-compared and displayed graphically, as in Fig. 1. on page 3 :

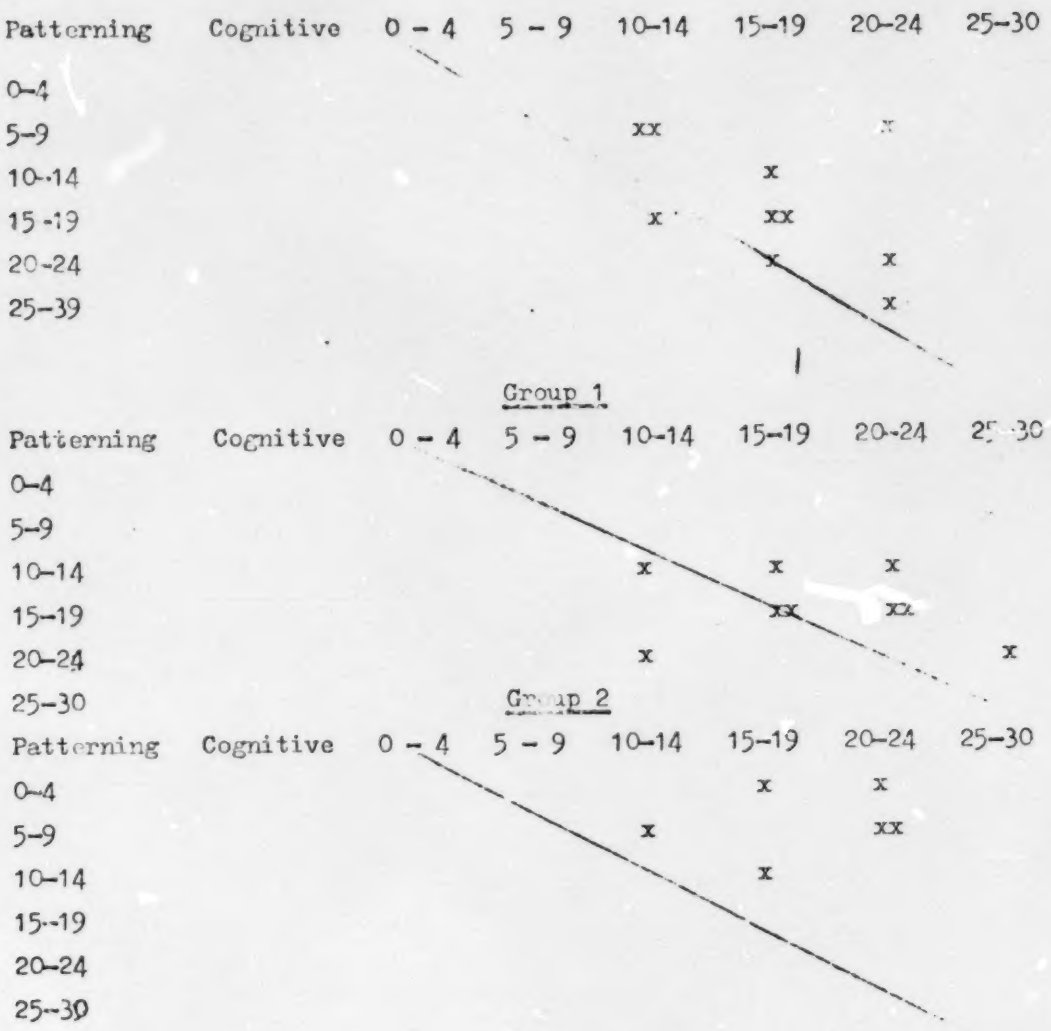

Fig 1 : Comparison of Both Scores (Initial Test)

The hypotheses generated from inspection of these results were:

1. There is indeed a teachable and testable set of skills involved in making organised notes, which does not occur to any marked extent unaided.

2. Such skills are distinct from cognitive grasp of the content of the test passage, as measured by reproduction of key material irrespective of form, but:

   2b) final accuracy of the made note is related to the extent of that grasp (cf. fig. 1 diagonal lines)

3. Overall, the machine programme and class teaching are approximately equally effective, but :

   3a) machine teaching enables the cognitively brighter students to produce a superior made note, in terms of patterning, than class teaching does,

   3b) machine teaching however does not enable the cognitively weak student to produce as good a made note, in terms of patterning, as class teaching (cf. the small 'tails' on Groups 1 (neg') and 2 (pos')).

The evidence for 3b) was however very slight.

Work testing these hypotheses was carried out with a larger group of students during November and December 1975, using the same grouping, teaching, testing and scoring procedures as the initial sample. There were six first year classes in all involved this time, comprising full-time students in Electrical Engineering, Mechanical Engineering, Environmental Engineering and Chemistry, and part-time (HND) students in Chemistry and Medical Laboratory Subjects.
The results of the tests are printed below :

Cognitive Groups

Group / Score	0 -4	5 - 9	10-14	15-19	20-24	25-30
1	-	-	1	7	12	5
2	-	-	1	7	11	1
3	-	2	2	1	6	-

Patterning Behaviour

Group / Score	0 -4	5 -9	10-14	15-19	20-24	25-30
1	-	4	4	6	11	-
2	-	-	6	8	6	-
3	1	7	2	1	-	-

Table 2 : Test Results (Repeat Groups)

Graphs displaying the relationship between patterning skill and cognitive grasp for each group are appended at the end of this paper (Figs 2 -4).

For this larger sample, it was now possible to calculate levels of significance for score differences between and within groups, and these were found to be as shown below:

Cognitive Grasp Group 1 against Group 3 : p approx. 0.18
Group 2 against Group 3 : p approx 0.6
Group 1 against Group 2 : p approx 0.4

Patterning Behaviour Group 1 against Group 3 : p less than 0.01 (highly significant)
Group 2 against Group 3 : ditto
Group 1 against Group 2 : whole score range : p approx 0.17
Group 1 against Group 2 : top tail only : p approx 0.06 (borderline)

Internal (Patterning against Grasp) Group 1, p between 0.01 and 0.02
Groups 2, p less 0.01
Group 3, ditto (All three are highly significant)

From these results, it was possible to note the following:

1. The distribution of scores of cognitive grasp was always further up the scale than the distribution of scores of patterning ability, and tended in all cases to have a positive skew. One explanation for this might be that scores of cognitive grasp relate to previously taught reading skills and skills in recording material (in any form) within a time limite, both of which tend to be favoured in any case by U.K. - style selection for higher education, geared as it is to an examination system aimed at producing an academic elite.

2. Both taught groups scored significantly better than the control on patterning skills.

3. The class taught group scores were the closestto a Gaussian distribution for both factors.

4. The existence of a 'two-tailed curve' (more doing better and more doing worse, than is expected) for the machine taught group's patterning scores was confirmed (the upper tail of this, compared with the class taught group's upper score range, came very close to significant difference).

5. Although neither taught group scored significantly better than the control on cognitive grasp, the machine taught group came a good deal nearer to it than did the class taught group.

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We then considered the initial hypotheses in the light of this second set of results, the following conclusions would seem to emerge:

First, the hypothesis about notemaking being a skill and being teachable /and testable) would appear to be confirmed.

Second, it would seem that these skills are indeed, as supposed, largely distinct from cognitive grasp of content. However, conclusion 5 above seems to suggest that machine teaching of patterning skills tends weakly to assist students in improving their scores on cognitive grasp also. This could perhaps be a result of either of two possible factors – on the one hand, clearly the patterning procedure does include something not unlike a simple content analysis, so that following it may well increase the students level of perception of the material of the extract, or, on the other hand, the machine situation itself may be the factor concerned, either by demanding additional concentration from all students or by increasing the level of the instruction of the brightest students (or both). This tendency is admittedly a weak one, but, if it means anything, then it may well be important in helping lecturers to decide whether or not to adopt this system. Further testing would seem to be called for here.

Third, the earlier finding that the overall results of machine teaching and class teaching are not substantially different is confirmed, as are the giles to it. There is now more subtilisation of the sub-hypotheses, however, as follows:

(a) patterning always increases with cognitive grasp (even for the control group). However, it does so very much slower for that group, and fastest of all for the machine taught group,

(b) <u>both</u> taught groupshave 'tails' of students with a lower patterning score than their score for cognitive grasp would suggest, but that for the class taught group is much smaller and less marked than that for the machine taught group. (This appears to relate to the supportive nature of class teaching),

(c) the increase in patterning does indeed rise as rapidly as the increase in cognitive grasp for the machine taught group for most of the levels of cognitive score: however, at the very highest levels its rate of increase tends to fall off (though it is still faster than that for the class taught group,)

Overall, therefore, the hypotheses are confirmed: machine teaching of this skill would appear acceptable. Finally, the re-running of the programme did demonstrate that some technical problems still exist primarily, to do with displacement of the slides in hands-on use, and occasional fading of some electronic pulses. If this programme is to be widely used, it needs to be under the frequent and regular supervision of a skilled technician.

The programme can now be regarded overall however as proven, and possible developments of it for other disciplines (e.g. language translation) are under study.

FIG 2: MACHINE GROUP (REPEAT)

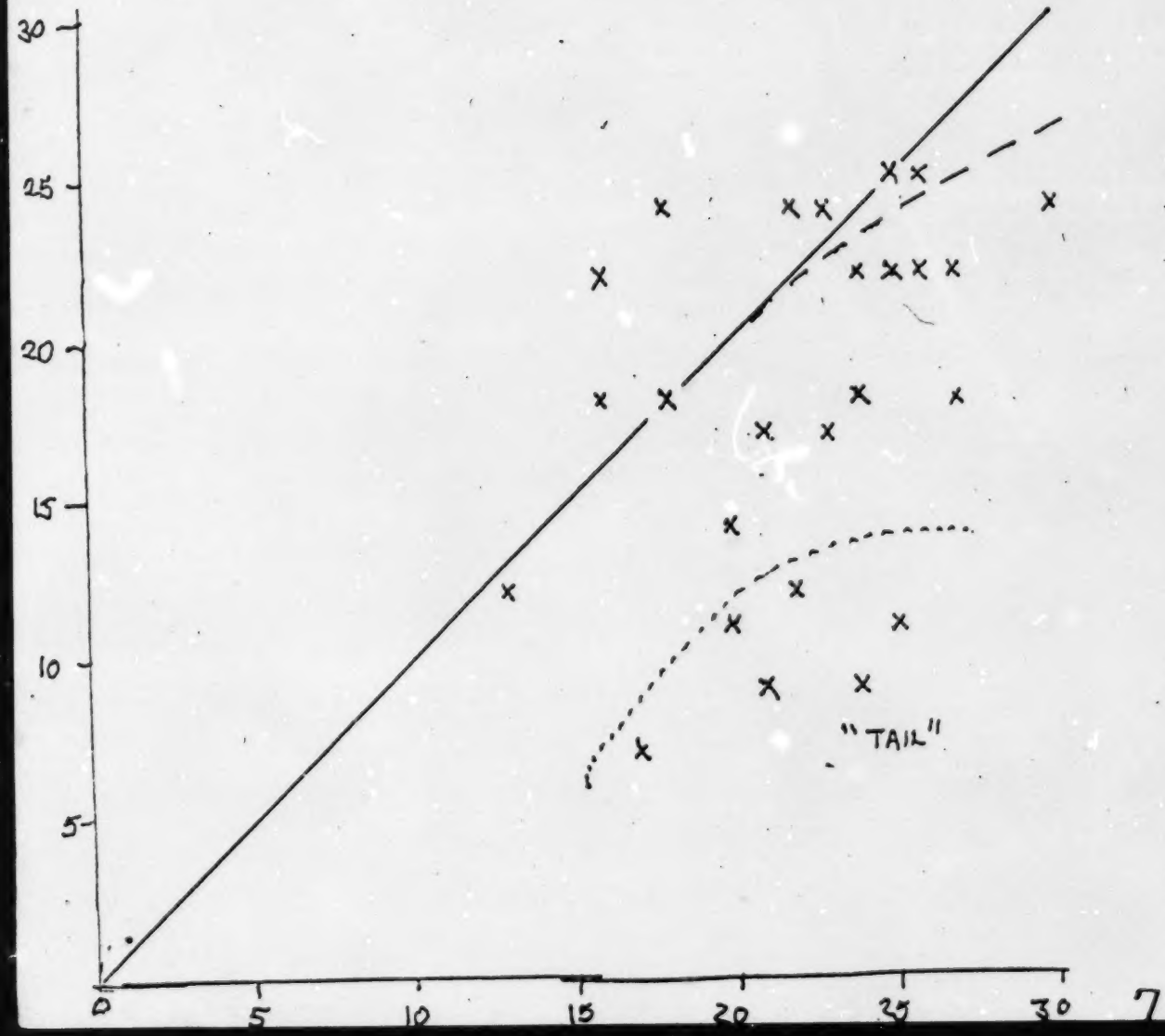

FIG 3: CLASS GROUP (REPEAT)

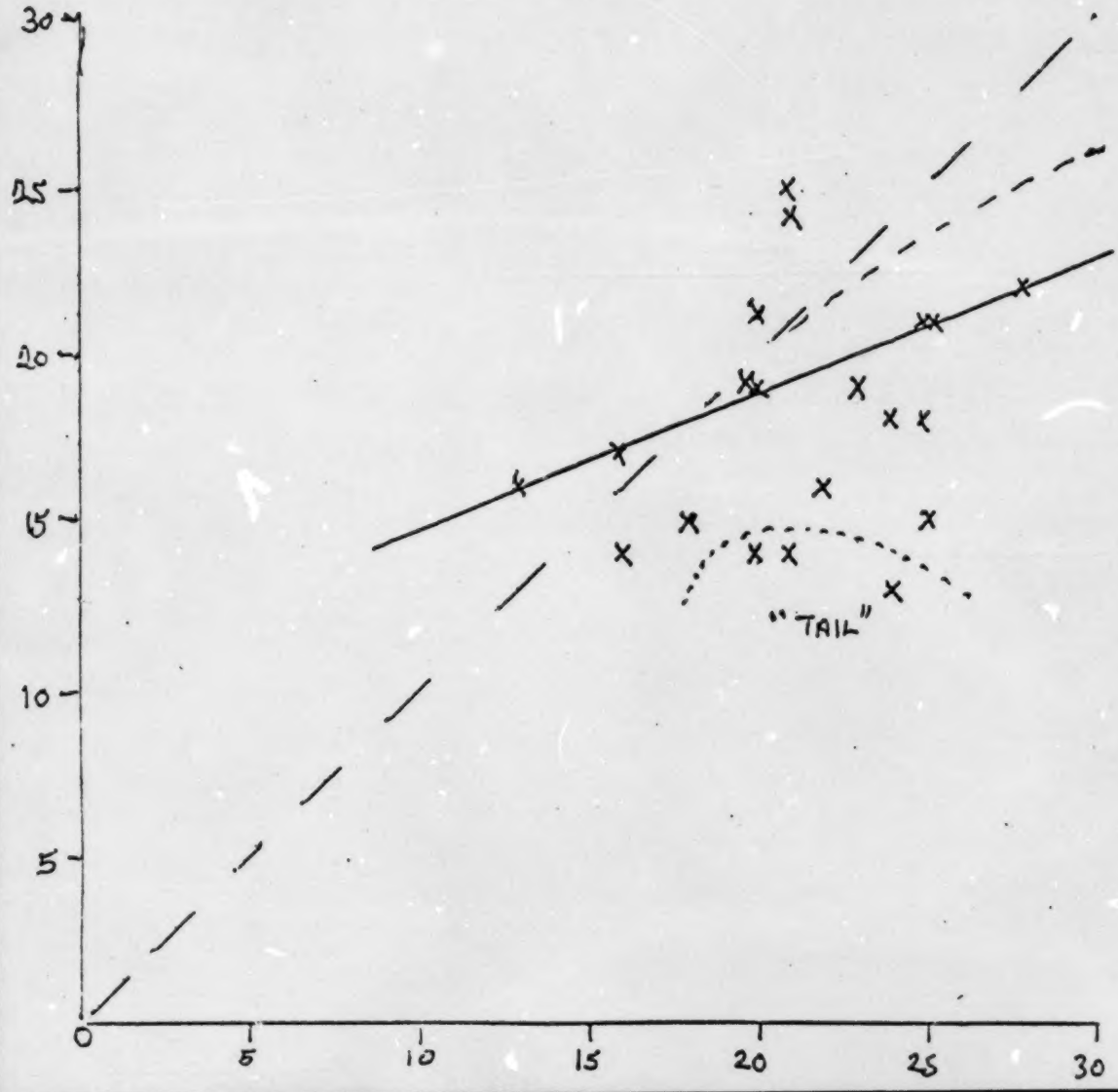

FIG 4: CONTROL GROUP (REPEAT)